#16

VERNON E. BROCK

DEPARTMENT OF ICHTHYOLOGY

Rhodes University, Grahamstown

ICHTHYOLOGICAL BULLETIN No. 16

ISSUED SEPTEMBER, 1959

Library
NOAA, National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

THE IDENTITY OF

Scarus gibbus Ruppell, 1828

AND OF OTHER

PARROTFISHES OF THE FAMILY CALLYODONTIDAE

FROM

THE RED SEA AND THE WESTERN INDIAN OCEAN

By

J. L. B. SMITH

Research Professor and South African Council
for Scientific and Industrial Research Fellow in Ichthyology.

Illustrations by Margaret M. Smith.

(Published by the Department of Ichthyology, Rhodes University, Grahamstown, South Africa.)

H. J. SOLE, PRINTER, GRAHAMSTOWN.

ACKNOWLEDGEMENTS

The main funds covering the cost of a visit to various European Museums were provided jointly by the South African Council for Scientific & Industrial Research, and Rhodes University. The publication of this Bulletin has been made possible by a special grant from the South African Council for Scientific and Industrial Research.

The great amount of work accomplished in a relatively short time was made possible by the cordial co-operation and assistance of the following fellow-scientists: Frankfurt; Dr. W. Klausewitz. Paris; Dr. J. Guibe and Dr. J. Arnoult. Copenhagen and Charlottenlund; Dr. F. W. Braestrup. London; Drs. E. Trewavas, N. B. Marshall, D. W. Tucker, G. Palmer and P. H. Greenwood. Amsterdam; Dr. J. Hoedeman. Leiden; Dr. M. Boeseman. To all of these I am greatly obliged for having given me the fullest and easiest possible access to the many valuable specimens in their charge. I am also greatly indebted to Dr. W. Klausewitz, Dr. M. Boeseman, Dr. J. Vinson (Mauritius) and Dr. F. W. Braestrup for important photographs, to Mrs. J. Bailey of Shimoni, and to Dr. L. P. Schultz for valuable specimens, and to Mr. F. W. Williams of Zanzibar for information about the sex of certain specimens. To my wife, Margaret M. Smith, I am indebted for the illustrations. I am also greatly obliged to certain members of both ground and air staff of South African Airways for consideration and facilities which rendered long flying hours much more endurable.

THE IDENTITY OF
Scarus gibbus Ruppell, 1828
AND OF OTHER PARROTFISHES OF THE FAMILY CALLYODONTIDAE FROM THE RED SEA AND THE WESTERN INDIAN OCEAN

(With Plates 41-45)

by J. L. B. SMITH,

Research Professor and South African Council for Scientific and Industrial Research Fellow in Ichthyology, Rhodes University, Grahamstown.

Parrotfishes have long been one of the major problems of the taxonomist, largely as a result of classification based on preserved material. Workers such Bleeker, who handled fresh specimens, provided useful descriptions and at least passable illustrations of Parrotfishes. There has, in consequence, been a general tendency to use such names in preference to those of earlier workers, notably Lacepede and Valenciennes, most of whose descriptions, based on long dead specimens, not only lack accurate, or indeed any, illustration, but rarely contain critical diagnostic data. In consequence, the nomenclature has been in a state of utter chaos, and any worker privileged to travel and examine early type specimens incurs a good deal of responsibility, since the majority of other workers are usually not in a position to query his opinions about their identities.

Following on my descriptive revision (Ich.Bull.1, 1956) of the Parrotfishes of the Western Indian Ocean, L. P. Schultz of the U.S. National Museum published (1958) a Review of the Parrotfishes of the World. Few workers have cared to face so formidable a task, and Schultz deserves every commendation for attempting it. His review will certainly lighten the task of the non-specialist worker in the Indo-Pacific. The most important contribution made in his review is that a classification based to some extent on the nature of the pharyngeal dentition, accords broadly with one based on more easily accessible external features such as cheek scales, gillrakers, etc., which most systematists find more practical.

Schultz also deserves commendation for attempting to provide illustrations of all species, for in Parrotfishes this is of prime importance. Unfortunately, however, despite the changes which occur in most cases with growth, he has given no information about the sizes of those illustrated, other than of type specimens of his few new species. It is to be regretted that a special effort could not have been made to reproduce in colour the numerous colour paintings he had available, prepared in the field by reliable artists. This would have added greatly to this review, for the monochrome reproductions of these paintings are of far less value than the originals.

Schultz was privileged to be able to travel and examine early types, and mainly from this work has presented extensive nomenclatorial reshuffling. Analysis of this in the case of W. Indian Ocean species is disquieting, as no reasons are given for much of his synonymy, and in some cases he has assigned priority on questionable grounds. Even when types have apparently vanished, Schultz has assigned definite identities to inadequately defined species, such as **forsteri** Val., 1839; in some cases he has selected such names as valid for the species. Although Schultz undertook a world revision of Parrotfishes, and visited London and Paris to examine types, there are some he apparently did not see, and he does not appear to have visited Amsterdam, Leiden, Frankfurt or Copenhagen, where at least equally important critical types of parrotfishes of Forskal, Ruppell and Bleeker are stored. It is indeed remarkable that while the first Parrotfishes of the Indo-Pacific were named from the Red Sea, our knowledge of Red Sea forms rests mainly on work of a century or more ago; and in effect, relatively little is known about the Parrotfishes of that area. It so happens however, that the Red Sea species are of great importance for the nomenclature of the family, and his failure to examine the early types from there has led Schultz into grievous errors.

My work (chiefly Ich.Bull.1, 1956) has shown the Western Indian Ocean to have a rich fauna of Parrotfishes, which, from extensive study in the field, we came to know, both alive and newly dead. Despite the extent of this fauna, and of that of the Red Sea, revealed by the early studies of Forskal, Ruppell and Klunzinger, Schultz apparently made no special attempt to examine the type specimens of those workers, nor to secure representative material of that region. In that connection, he has levelled a curious accusation at me, writing (1958, 15) "Smith .... made no serious attempt to exchange specimens of Parrotfishes with other institutions, even though invited to do so." I am compelled to state that I cannot, however, recollect, nor does the most careful search of our files reveal, any specific request from Schultz for an exchange of Parrotfishes, or from any other worker, anywhere, at any time.

I have recently visited European Museums in order to examine available types of these fishes. This confirms that some decisions of Schultz were erroneous. Some typical cases may be cited here (i) Schultz

1958, 12 lists **Scarus sexvittatus** Ruppell, 1835, as not identifiable; but the type, in good condition, is in Frankfurt, and there is little doubt that it is the species that Schultz describes as **Scarus randalli n. sp.** (ii) In connection with the generic cleavage he proposed, Schultz stressed the importance of **Scarus gibbus** Ruppell, 1828, thus (1958, 25) "It is very important to know what species was meant, since **S. gibbus** . . . is the genotype of **Chlorurus** Swainson." Without, however, having examined that type, and ignoring Ruppell's and Klunzinger's published data, he goes on to say that its features "leave no doubt in my mind that **gibbus** is what has been currently passing under the name of **S. muricatus** C & V, 1839." One glance at the type of **gibbus** in Frankfurt would have disposed of that view. Study of my Indian Ocean material, and comparison with published descriptions and illustrations, in 1956, left no doubt in my mind that **gibbus** and **muricatus** could not be other than distinct, a conclusion again fully confirmed by the evidence given below. In his discussion on generic cleavage, Schultz (1958, 15) went so far as to castigate the new genera I had proposed (1956) as "ignoring many of the rules of Zoological nomenclature." In fact, however, as defined in 1956, and reasserted here, not a single new genus proposed and defined by myself has been anticipated by an earlier genus. Instead, the collapse of the false **gibbus-muricatus** edifice erected by Schultz, not only demolishes a good part of his plan of generic cleavage, but re-establishes my own more firmly than before.

At a lower level, as shown below, Schultz has grouped certainly 2, possibly even 4 distinct species in the synonymy of **Scarus harid** Forskal. In the matter of **bipallidus** Smith, 1956, he indicates that, before he saw a specimen, he had synonymised this species with **sordidus** Forskal. It was only when he received one at a later date that he admitted the validity of **bipallidus**; the addendum in which this appears concludes with the following statement: "No doubt a study of new material from various parts of the world will make it validate other doubtful species, now placed in synonymy by me," which is scarcely conducive of confidence in the rest of his work. Probably the most troublesome of systematic problems result from earlier confusion of species. When there is any reasonable doubt about the identity of specimens, it is far better for an author to treat, or to describe them as separate species, rather than to take even the slightest risk of confusing different forms, especially, as in this case, in the absence of actual specimens. Lumping together, without individual description, what are, or may later prove to be different species, creates confusion far more difficult to resolve than description of the various types as distinct. Even here Schultz is not consistent, for he has resolved 2 colour variations of **capistratoides** Bleeker, (illustrated in my 1956 review) into two species, probably from lack of experience of the living fishes.

It should be noted that sexual dimorphism in this group is clearly so general that much of the present taxonomic scheme will have to be revised, but this must be done in the field, where every specimen can be sexed. Parrotfishes decay so rapidly, that, even with injection, it is rarely that sex can be determined in preserved fishes. Where two apparent species show identity in main features, such as predorsal and cheek scaling, and pectoral ray count, but differ in markings and in caudal shape, sexual dimorphism is strongly suggested.

As a result of my own recent investigations in Europe and from the work of Schultz, some of the names used by me in 1956 are revised here.

As doubts have been expressed about the durability of the paper used for the 1956 colour plate printing, I have fortunately been able to secure funds to reprint these on a paper more likely to endure.

A full account of my observations and conclusions about the identities of type specimens of Parrotfishes in Europe will be published elsewhere. A revised synoptic review of the Parrotfishes of the W. Indian Ocean is given at the end.

The Status of **Scarus** Forksal, 1775.

The genus **Scarus** Forskal, 1775, 25 was not truly defined by Forskal, indeed the first 4 species mentioned by him do not fall in even the family as now defined The genus was established when Jordan & Gilbert 1882, 938, selected **psittacus** Forskal, the 4th species of Parrotfish listed by Forskal, as the type (possibly because the synonymy given by Gunther 1862, 223 for **psittacus** Forskal, indicated this as a widespread, abundant species). However, **psittacus** Forskal, is preoccupied by Atlantic **psittacus** Linn, 1758. As long as only one genus was recognised in the family, the identity of **psittacus (non** Linn) Forskal, except as a member of the family, was not important. But once other genera are recognised, in order to establish **Scarus** Forskal, it is necessary to know the true identity of **psittacus (non** Linn) Forskal, (the type of which no longer exists), since whatever species Forskal had named **psittacus**, if it could be identified, would become the type of **Scarus** Forskal. Hardly any of Forskal's descriptions contain data of real diagnostic value, even for species in the type locality, (whose parrotfishes are probably the poorest known of any region where they abound). It is indeed not truly in keeping with scientific accuracy to accept any of Forskal's species in the absence of the type. Unfortunately, neither Ruppell nor Klunzinger apparently saw Forskal's types, but both made every effort to secure and define Forskal's species. Even with the advantage of covering the same area as Forskal, their conclusions in this case are conflicting, and in the absence of their specimens not certainly resolvable. These difficulties of Ruppell and Klunzinger are certainly in part due to and clearly indicative of the absence of critical diagnostic data in Forskal's definition of his **psittacus.** Like many before and since, Ruppell and Klunzinger obviously found the parrotfishes troublesome, and even when they later worked from their own notes and preserved fishes, were plainly often in doubt, even confusing species. In the British Museum is a 195 mm. specimen from the Red Sea, identified by Ruppell as **Scarus ghobban** Forskal, which is not that

Digitized by the Internet Archive
in 2025

https://archive.org/details/ichthyological-bulletin_1959-09_16

PLATE 41

A. *Xanothon bataviensis*, 10 ins. B. *Callyodon mus*, 9 ins. C. *Callyodon frenatus*, 10 ins. D. *Xanothon bipallidus*, 12 ins. E. *Callyodon improvisus*, 14 ins.; below, head, variation. F. *Xanothon capitaneus*, 14 ins. G. *Callyodon scaber*, 10¾ ins. H. & I. *Callyodon sexvittatus*: H, 9 ins.: I, 10 ins. J. *Callyodon lepidus*, 9 ins. K. *Xanothon oktodon*, 14 ins.

species, but **Xanothon fowleri** Smith, 1956. Ruppell 1828, 77, Pl 20, f 1, described and figured the species he identified as **psittacus** Forskal, 1775. His illustration is clearly what now passes as **ghobban** Forskal (**guttatus** Bloch-Schn., 1801); but his description, p 77, indicates confusion of species, for he states that his specimens of **psittacus** Forskal "often have 1, 2 or 3 conical upper canines," which, while stated by Forskal, 29 as the case with his **psittacus**, has so far not been observed in **ghobban** from any source. Gunther 1862, 223 apparently accepted Ruppell's 1828 diagnosis of **psittacus** Forskal, for he aligns it with **pyrrostethus** Richardson, 1845 now generally accepted as a synonym of **ghobban** Forskal. Klunzinger 1871, 564, however, dismisses this conclusion of Ruppell and Gunther, and on p. 566 expresses the view that **psittacus** Forskal, is the same as **forskalii** Klunzinger, 1871, from the Red Sea, which latter I have now found to be **bataviensis** Bleeker, 1857. Klunzinger bases this conclusion chiefly on Forskal's 1775, 29 words "virescens....maxilla....superior utrinque tribus dentibus patentibus, inferior utroque latero uno. Linea lateralis ramulosa, prima terminata sub fine pinnae dorsi, altera sub illa eodem local incipit in medio corpore." Klunzinger assumes that by "dentibus" Forskal meant "canines," but this is not certain, for in all his other descriptions of parrotfishes, when he indicated lateral canines, Forskal used the words "caninis" or "canini". While it is true that **bataviensis** Blkr., is one of the few species that sometimes has 3 canines in the upper jaw, very large male **harid** Forskal, have a number of canines and enlarged units of the dental plates intergrading, indeed in his description of **harid**, Forskal, p. 77, mentions both "dentes" and "caninum". Regarding the "completely discontinuous" lateral line, this is true of **bataviensis**, but also of **harid** and others. It is significant that, while in some cases, e.g. **ghobban** Forskal, Klunzinger gives the same Arab common name, viz. "ghobban", as Forskal, the Arab name given by Klunzinger for his **forskalii** differs from that given by Forskal for **psittacus.** Beyond all this the markings given by Forskal for **psittacus** are not in any way critically diagnostic.

It is significant that other workers on parrotfishes of recent times, such as Fowler & Bean 1928, and Weber and de Beaufort 1940, have not accepted **Scarus** Forskal, and have named the family **Callyodontidae.** Schultz 1958, 29 has, however, reverted to the use of **Scarus** Forskal, but on a different basis. He has rejected all former opinions about the identity of **psittacus** (**non** Linn) Forskal, stating (1958, 13, 29 and 50) as a bare opinion, without any reasons, that **S. psittacus** Forskal, = **S. harid** Forskal, thus making the latter the type of **Scarus** Forskal. Equally strange is that Schultz then proceeds to contradict his own arbitrary decision, for on p. 30 he puts **Scarus psittacus** Ruppell = **Scarus psittacus** Forskal, hence indicating **S. psittacus** Ruppell, 1828 = **Scarus harid** Forskal, which it can scarcely be, for the fish illustrated by Ruppell as **psittacus** is unmistakably what is now accepted as **ghobban** Forskal, and it is most unlikely that Ruppell could have mistaken the characteristic **harid** for any other species. Schultz evades resolution of this further confusion created by his own conflicting opinions, for no further reference to **Scarus psittacus** Ruppell, can be found in his 1958 review. This bare opinion that **psittacus** Forskal = **harid** Forskal, does not accord with available facts, and must be dismissed from lack of evidence.

These conflicting opinions about the identity of **psittacus** (**non** Linn) Forskal, constantly emphasise that the original description of **psittacus** Forskal, 1775, does not give sufficient data to determine with any certainty what species it really was: and even if it were certainly known (which it is not) that it was one of the 3 suggested species, viz. **ghobban, harid** or **bataviensis**, I do not find the data sufficiently clear-cut to decide between them. It may be emphasised that both **ghobban** Forskal, and **harid** Forskal, are abundant in the Red Sea, and, are, moreover, when alive and fresh, such characteristic and easily recognisable species, that it is difficult to believe that Forskal, who had named both species, and who must have seen and handled many specimens of both, could have failed to recognise a specimen of either. This makes it most unlikely that **psittacus** Forskal, was either of these. Only about 15 species of parrotfishes have so far been positively recorded from the Red Sea; there must be many more, so that **psittacus** Forskal, may well have been one not found by any later worker. That this is not unlikely is shown by the case of **gibbus** Ruppell, 1828. Ruppell got two 18-inch specimens (now in Frankfurt), but since that time there has been no further certain record of this species from the Red Sea, or elsewhere.

In the absence of the type, therefore, it is here maintained that no definite identity can be assigned to **psittacus** (**non** Linn) Forskal, 1775. The retention of the genus **Scarus** Forskal, therefore, rests on no more than guesswork, and its rejection is recommended.

KEY TO GENERA OF THE WESTERN INDIAN OCEAN

A. Cheek above preopercle flange with 2 series of scales;
Flange naked or scaly :

I. Preopercle flange typically naked. Always 4 predorsal scales. More than 40 fine rakers on 1st arch. P 2, 12-13 ..... 1. **Xanothon**

II. One or more scales on preopercle flange, may become embedded with age. (Mostly 6-7 predorsal scales):

(a) Hind nostril large, slit-like, with age equals eye. Less than 20 rakers on whole 1st arch. 4-5 median predorsal scales. Front of occiput flat, bulbous with age. No canines. P 2, 14. Lower L.l. more than 10 ..... 2. **Bolbometopon**

(b) Hind nostril never equals eye. More than 25 rakers on whole 1st arch. Occiput if swollen not flat in front. P 2, 12-13. Lower L.l. less than 10. 3. **Callyodon**

B. Cheek above preopercle flange with at least three series of scales, flange always naked :

I. Nostrils distinct, close together, the hinder much enlarged with age to at least pupil size. Less than 25 rakers on whole first arch. No canines. Pectoral shorter than snout in adults. P 2, 12 ..... 4. **Cetoscarus**

II. Nostrils small, separate, barely if at all enlarged with age. More than 30 rakers on whole 1st arch. Canines in males. Pectoral longer than snout at all stages. P 2, 13-14.

A. Nostrils always distinct. Snout blunt, swollen before eyes with age. Depth of peduncle in males about 2 in head. Cheek scales in subquadrangular patch. P 2, 14 ..... 5. **Chlorurus**

B. Nostrils almost obsolete with age. Snout pointed, more so in males and with age. Depth of peduncle in males about 3 in head. Cheek scales in acutely triangular patch in 3-4 series behind. P 2, 13 ..... 6. **Hipposcarus**

1. **Xanothon** Smith, 1956.

Genotype **Callyodon bipallidus** Smith, 1956. Although not accepted by Schultz 1958, this is reaffirmed as a well defined natural assemblage of species, characterised by having 2 series of scales on cheek, the flange below naked, and 4 median predorsal scales. Despite the number of genera previously proposed in this family, not one has a genotype with the above combination of characters.

XANOTHON BATAVIENSIS (Bleeker), 1857. Bleeker 1857, 342 and 1862, 48, Pl 12, f 3. Smith 1956, 6, Pl 41, A. **Pseudoscarus forskalii** Klunz., 1870. **X. parvidens** Smith 1956, 7, Pl 45, E. Schultz 1958, 64 selected **forsteri** Val., 1839 as the name for this species, giving, in order of priority, **forsteri** Val., 1839: **quoyi** Val., 1839: **cyanotaenia** Bleeker, 1854; **bataviensis** Blkr., 1857. The type of **forsteri** Val., cannot be traced, and the original description, so little diagnostic as to indicate, but not define, a number of species, is not acceptable. In the bottle labelled **Scarus quoyi** Val., 1839, type, in Paris, I found 2 species, No. 579 has a truncate tail, whereas in No. A 9292 the lobes are produced. The original description of **quoyi** is poor, but states tail truncated, therefore No. 579 must be taken as the type of **quoyi** Val. (q.v.), and while No. A 9292 is undoubtedly **bataviensis** Blkr., 1857, the name **quoyi** Val. cannot be used for that species. Schultz 1958, 64 identified the type of **cyanotaenia** Blkr., 1854 in the British Museum, as this species, but I find that type to be unquestionably **capistratoides** Blkr., 1847, and **cyanotaenia** falls away from the synonymy of this species, which, therefore, becomes **bataviensis** Bleeker, 1857 as previously used in my 1956 review. **Pseudoscarus forskalii** Klunzinger, 1871 (apparently not seen by Schultz), No. 71.7.15.4, British Museum, is this species.

XANOTHON VENOSUS (Val.) 1839. **Scarus taeniurus** Val., 1839, 257 (Maur.). **Pseudoscarus pentazona** Blkr., 1862, 46, Pl 11, f 1. **Xanothon pentazona** Smith 1956, 7, Pl 44, H (W.Ind.Oc.). I have examined the types of **venosus** Val., 140mm. and 150mm. respectively, from Bourbon: and of **taeniurus** Val., 172 mm. length. The differences between these 2 species are such as to make me suspect that they will prove to be sexual only, and I unite them here. **pentazona** in Smith 1956, 7, Pl 44, H falls with **venosus.**

XANOTHON FOWLERI Smith 1956. Smith 1956, 5, Pl 42, G (**frenatus non** Lac.). This species was identified by me with some doubt as **frenatus** Lacepede, 1802, the differences indicated as probably justifying specific distinction, **fowleri n. sp.** being proposed. Schultz 1958, 52 synonymised this species with **javanicus** Bleeker, 1854 but on what grounds is not clear. **fowleri** Smith, as described and shown, is sharply distinguished from **javanicus** by having only 2 rows of scales on the cheek, flange below naked, in life a bright yellow cheek, no dark spot on pectoral base, and well marked green bars on caudal. In **fowleri** the dark front of the body ends well before anal origin, in **javanicus** it is more posterior. **fowleri** appears to be as well distinguished from all other species, but I am inclined to suspect that **carifanus** Smith, 1956 is the female, a matter which can be settled only with fresh material. Schultz 1958, 62 has synonymised **carifanus** with **taeniurus** Val., but on what grounds is not clear, for **carifanus** appears well distinguished from that species. A 195 mm. length fish in the Brit. Museum, No. 98-100, from the Red Sea, identified by Ruppell as **ghobban** Forskal, is **X. fowleri.**

XANOTHON CAPITANEUS (Valenciennes), 1839. Smith 1956, 5, Pl 41, F. A specimen, 340 mm., Pinda, Moz., agrees closely with Valenciennes' description and illustration. From examination of the types in Paris, Schultz synonymised **capitaneus** Val., and **cyanescens** Val., and gave priority to the latter, although the former has clear page preference, and a good illustration. I have examined the types in Paris. That of **capitaneus** is a dried skin, in good condition, but for having P 2, 12 it agrees with my specimen, and there seems no reason why **capitaneus** Val., should not be used for this species, which is apparently not known beyond the W. Indian Ocean. It is difficult to understand how Schultz could have considered the type of **cyanescens** identical with **capitaneus,** it is plainly a different species, having a gibbous profile of head, no trace of canines, the D & A with ½ pupil width light border still visible. With such ancient faded material I am not prepared to suggest the true identity of Valenciennes' type of **cyanescens.**

XANOTHON CAPISTRATOIDES (Bleeker) 1847. **X. capistratoides** Smith 1956, 6, Pl 43, A & B. **Pseudoscarus cyanotaenia** Blkr. 1854, 197: 1862, Pl vi, f 1. Two extreme colour phases of this species were illustrated in Smith 1956, Pl 43, A & B. Schultz 1958, 64 separated the two as different species, identifying Fig.

B as **forsteri** Val., 1839 (i.e. **bataviensis** Blkr., q.v.). Having handled hundreds of fresh **capistratoides**, and seen even more under water, I have no hesitation in dismissing the opinion of Schultz. **capistratoides** has a characteristic appearance, both live and dead, as to make it one of the most easily identifiable in all its phases. Schultz also identified the type of **Scarus cyanotaenia** Blkr., 1854 as **forsteri** Val. (= **bataviensis** Blkr., 1857), but I have examined that type (in B.M.) and it is unquestionably not that species, but **capistratoides** Blkr., 1847, 49, very clearly distinct from **bataviensis (forsteri)**.

The Status of **Scarus sordidus** Forskal, 1775, 30.

The original description could apply to the juvenile stadia of several species; it is not clearly diagnostic, and assigning this name to any species is almost pure guesswork. Most workers have found parrotfishes that fall in this category difficult. Schultz has boldly accepted **sordidus** Forskal, as a valid defined species, and has given an involved synonymy, in which careful analytical work will almost certainly reveal several species. Although we handled thousands of Parrotfishes of all sizes, we found not one that could be identified with the **sordidus** of Schultz 1958, 68, Pl 12, A. B. There are innumerable hosts of small brown parrotfishes in East Africa, that fall in **Xanothon** Smith. I could distinguish two species without canines; described as **margaritus** Cartier, 1874 and **erythrodon** Val., 1839, both with red teeth. As this group needs further investigation these two species are still maintained here.

2. **Bolbometopon** Smith, 1956.

Type **Scarus muricatus** Valenciennes, 1839, monotypic. Related to **Cetoscarus** Smith, 1956 by several features, this fish merits generic distinction from all others by the characters given in the key to genera. In large adults, while the gibbosity is mainly cartilaginous, the frontal bone itself is much enlarged. It should be noted that almost all information given by Schultz 1958 about **gibbus** Ruppell, 1828 really pertains to **muricatus.** The type (Java) could not be found in Paris, but the original description and illustration adequately define the species.

Fig. 1. Nostrils of **Bolbometopon muricatus** Val., fish 1110 mm. length.

3. **Callyodon** (Gronovius) Scopoli 1777.

Genotype **Calliodon lineatus** Bloch-Schneider, 1801 = **Scarus croicensis** Bloch, 1790. Defined as in the key above, according to which, synonyms are: **Petronason** Swainson, 1839. **Erychthys** Swainson, 1839. **Hemistoma** Swainson, 1839. **Loro** Jordan & Evermann, 1895 (all are also synonyms of sub-genus **Callyodon**, in having one or more scales on preopercle flange: more than 3 median predorsal scales, and occiput and snout not swollen with age.)

Callyodon may for convenience be sub-divided as follows:—

A. 3 median predorsal scales ..... A. Subg. **Ypsiscarus**
B. More than 3 median predorsal scales:
  I. Each upper pharyngeal with only one row of teeth, not or hardly interdigitate (one species) ..... B. Subg. **Scarops**
  II. Each upper pharyngeal with one main and one outer smaller row of teeth inner interdigitating (most species):
    a. Occiput and snout normal ..... C. Subg. **Callyodon**
    b. Occiput and snout swollen with age ..... D. Subg. **Margaritodon**

3A. Subgenus **Ypsiscarus** Schultz, 1958.

Type **Callyodon oedema** Snyder, 1909. Chiefly distinguished by only 3 median predorsal scales. Type from the Pacific, one species in the W. Indian Ocean.

CALLYODON (YPSISCARUS) VIRIDIFUCATUS (Smith), 1956. Smith 1956, 12, Pl 42, fs B & I. Originally described (inexplicably) as having 4-6 predorsal scales, re-examination shows there to be only 3 truly median predorsal, with a pair in front overlapping the occiput. The upper pharyngeals each have one main and one rudimentary series of teeth, the former interdigitating. Schultz, 1958 erected subgenus **Ypsiscarus** (type **oedema** Snyder, 1909) chiefly on there being only 3 median predorsal scales. The diagnosis will need amendment, as **oedema** has preopercle flange naked, P2, 13, and greatly swollen forehead in adults. **viridifucatus** has 2 rows of scales on cheek, and 2-3 on flange below. This species was (with doubt) referred by Schultz 1958, 54 to **lunula** Snyder, but is clearly distinct. In **viridifucatus** there is constantly one less median predorsal scale than in **lunula**, a more rounded snout, dental plates of different shape, canines present from a small size, and head markings (Smith 1956, Pls 42, 43) constantly different. **viridifucatus,** widely distributed and not rare in the W. Ind. Ocean, is easily recognisable, both preserved and alive, and appears a valid species.

3B. Subgenus **Scarops** Schultz 1958, 16, 18.

Type **Scarus rubroviolaceus** Bleeker, 1849. In revising the W. Indian Ocean forms, I had considered separating this species at least sub-generically, and accept this basis of distinction by Schultz, but not as full genus as proposed by him. Only the type in the W. Indian Ocean.

3C. Subgenus **Callyodon**

CALLYODON MUS Smith, 1956. Smith 1956, 13, Pl 41, B. **Scarus dussumieri** (**non** Val.) Schultz 1958, 100, Pl 20, A. Most workers have confused two species as **dussumieri** Val., 1839. By including **mus** Smith, 1956 Schultz has increased the number to three, (see discussion under **Callyodon speigleri** below). The species **mus** Smith, 1956 is certainly neither **dussumieri** Val., nor **dussumieri** (**non** Val.) Bleeker. The type of **mus** has 4 scales on the preopercle flange, the types of **dussumieri** Val. have 0 or 1, whereas **dussumieri** (**non** Val.) Bleeker (= **speigleri** Smith) has 2 or 3. In **mus** a green band runs from the upper lip to or near the edge of the opercle. The fish shown in Schultz 1958, Pl 20, A agrees with the general features of **mus**, which I reassert as valid.

CALLYODON APRIDENTATUS Smith, 1956. Smith 1956, 14, Pl 44, F (Kenya). This well-defined species is characterised by P 2, 13; 6-7 median predorsal scales, 2 rows on cheek, 1-2 on flange below, teeth white, the beak broad, well exposed, 2 stout upper canines. Rare, attains 35 ins. The original type was lost in transit, but another, 27 ins. length (7 median predorsal scales) has been secured, which confirms the data given above. From my 1956 description and illustration, Schultz 1958, 51 synonymised this species with **harid** Forskal, an opinion probably unique in ichthyology, as one glance at the illustrations will show. The original description stated, and clearly shows, in Fig. 44, F; well exposed teeth, as well as a strongly convex snout profile, a dominantly green and yellow colour, and only 2 series of scales on cheek above the flange. None of these are characters of what has currently been named **harid** Forskal. Schultz, **ibid**, further states "fig. 44, F shows only 4 median predorsal scales, not 6 as stated by Smith." Examination of fig. F, Pl 44, makes this statement equally incomprehensible. There is little doubt that **apridentatus** is a valid species, it is certainly not identical with **harid** Forskal, which it does not even remotely resemble. I suspect it is **apridentatus** that Klunzinger 1871, 565, discussed, and described briefly (Red Sea), as unusually coloured large **ghobban** Forskal, for **apridentatus** is closely related to that species.

CALLYODON SEXVITTATUS (Ruppell), 1835. **Callyodon upolensis** (**non** Jordan & Seale) Smith 1956, 11, Pl 41, H & I. **Scarus randalli** Schultz 1958, 97, Pls 19, C: 27A. Schultz 1958, 12 lists **Scarus sexvittatus** Ruppell, 1835, as "not identifiable", but the original type, 250 mm., standard length, in excellent condition, is in the Senckenberg Museum, Frankfurt. With 6 median predorsal scales, 2 series on cheek, 4 on flange below, P 2, 12, no canines, caudal lobes slightly extended, it is identical with my E. African specimens. Since Schultz 1958, 97 had no doubt that these were identical with **randalli** Schultz, and there is no evidence to the contrary, **randalli** becomes a synonym of **sexvittatus** Ruppell, 1835.

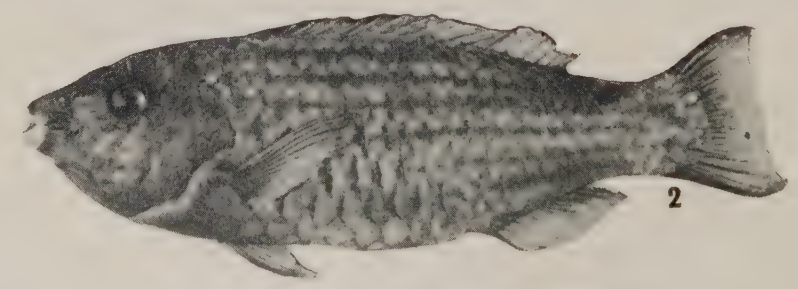

Fig. 2. Type of **Scarus sexvittatus** Ruppell, 1828.

PLATE 42

A. *Callyodon* (*Margaritodon*) *africanus*, 30 ins. B. *Callyodon viridifucatus*, 7 ins. C. *Chlorurus strongylocephalus*, 11 ins., male. D. *Xanothon carifanus*, 11½ ins. F. *Chlorurus strongylocephalus*, 20 ins., male. G. *Xanothon fowleri*, 13 ins. H. *Bolbometopon muricatus*, 40 ins.; on left, front of head. I. *Callyodon viridifucatus*, 9 ins. J. *Callyodon urbanus*, 12 ins. K. *Callyodon cyanognathos*, 11 ins.

CALLYODON FRENATUS (Lacepede), 1802. Schultz 1958, 83, f 13. **Pseudoscarus caerulescens** Valenciennes, 1839, 171 (Red Sea). **Callyodon vermiculatus** Smith 1956, 11, Pl 41, C. This species has been something of a mystery, and the live colours have never been described. Since the type, there has been no detailed description, and no illustration, of any specimen from the W. Ind. Ocean (the type locality). Schultz 1958, 83 had a specimen from the Red Sea, but despite the great interest attaching to it, gave only a sketch and few details. Schultz 1958, 83 continues the confusion by accepting **Pseudoscarus frenatus** Bleeker, 1862, 40, Pl 16, f 2 as **frenatus** Lac., even though this is plainly different from his Red Sea **frenatus,** and one about whose identity Bleeker clearly had doubts. Schultz was obviously confused himself, for on p 52, he puts the same **frenatus** of Bleeker 1862, 40, Pl 16, f 2 in the synonymy of **flavipectoralis**, his own **n. sp.** The type of **Scarus caerulescens** Val., 1839, in Paris, from the Red Sea, No. 2477, 350 mm. length (a species listed by Schultz 1958, 11 as "not identifiable") is **frenatus.** Lacepede's type came from the W. Ind. Ocean, and as almost all early types of Parrotfishes are common species, it has long puzzled me that **frenatus** has not again been certainly recorded or described from the type locality, and, further, that in all our intensive work in the W. Ind. Ocean we found none that from life could certainly be identified with **frenatus** Lacepede. We did find a relatively common species whose features and markings agreed closely with the Pacific **vermiculatus** Fowler & Bean, 1928, and I was struck by the close correspondence between that and **frenatus** (Smith 1956, 11). Recently in Frankfurt I examined a specimen, 310 mm. length, Red Sea, identified by Ruppell as **pectoralis** Valenciennes, which is clearly **frenatus**, and is not separable from my preserved **vermiculatus**, which now show no trace of vermiculations. I have little hesitation in uniting my specimens with **frenatus** Lac., at present known only from the Red Sea and W. Ind. Ocean, unless **vermiculatus** Fowler & Bean, from the type area (Pacific) is that species, as I believe may prove to be the case.

CALLYODON SPEIGLERI Smith, 1956. The types of **Scarus dussumieri** Val., 1839 were collected at Seychelles by Dussumier, the species reported abundant there. Bleeker 1862, 46, Pl 8, f 1, described and figured **Pseudoscarus dussumieri** Val., (this fish clearly different from that of Valenciennes), stating that he had 3 specimens, 390-402 mm. from Java, rare there. In 1953 we examined thousands of parrotfishes at Seychelles: although **dussumieri** Val., was stated by Dussumier to be abundant there, we did not find one like Bleeker 1862, Pl 8, f 1. The most abundant species at Seychelles is **ghobban** Forskal — and Valenciennes' brief diagnosis of **dussumieri** fits that species better than it does **dussumieri** of Bleeker 1862, Pl 8, f 1. Bleeker had plainly been confused about this species, for in his diagnosis of **dussumieri** Val., Bleeker 1862, 46 gives P 2, 13, and his Pl 8, f 1 shows P 2, 13, but a few lines later he states that **dussumieri** differs from (his) preceding species in having 12 pectoral rays. Because of this patent confusion, in 1956, 14, I named the fish described in Bleeker 1862, 46, Pl 8, f 1, as **speigleri n. sp.** In Paris the type bottle of **dussumieri** Val. contains 3 specimens, 2 from Seychelles (No. 1720), length 212 mm. and 234 mm., and one from Zanzibar (No. 1719), 203 mm. All markings faded, all have 6 preD, 2 rows on cheek, one scale below on flange, no canines, caudal lobes barely extended, and all have P 2, 13 except the larger specimen from Seychelles which has P 2, 12 on left side. I found these to be identical with specimens of **ghobban** Forskal, of equal size and age, confirming the view expressed in my review 1956, 2. In Amsterdam there is a specimen, No. 102,333, 240 mm. length, labelled **Pseudoscarus dussumieri** Bleeker. This has 6 preD scales, 2 rows on cheek, 4 on flange below, P 2, 13, upper canine, Cd lobes well extended, more than in Bleeker 1862, Pl 8, f 1, but no markings of any kind. It is clearly not Bleeker's type. In Leiden are 2 specimens labelled **Pseudoscarus dussumieri** Bleeker, No. 6664, of length 390 mm., 6 median scales preD, 2 rows on cheek, 2 scales on flange, P 2, 13, 1-2 upper canines, Cd lobes moderately extended, and narrow border to D and A exactly as in Bleeker 1862, Pl 8, f 1. These are clearly Bleeker's types, but different from No. 102333 at Amsterdam, and from Valenciennes' types in Paris. Schultz 1958, 100, unites **dussumieri** Val., **dussumieri** Bleeker, 1862 and **speigleri** Smith, 1956. He describes specimens from the Indian and Pacific Oceans as having 6 median preD scales, 2 rows on cheek and 1-3 scales on flange below, P 2, 12, teeth white, and stresses that specimens from the tropical W. Pacific all have P 2, 12.

There has obviously been widespread confusion of species, which is not likely to be resolved from preserved specimens. It seems, however, to be plain that **dussumieri** Bleeker, 1862 is not the same as **dussumieri** Val., 1839; but whatever may emerge from further work, which is plainly necessary, **dussumieri** Val., is a synonym of **ghobban** Forskal, and **speigleri** Smith, 1956 merits recognition.

CALLYODON CAUDOFASCIATUS (Gunther) 1862. **Pseudoscarus c.** Gunther 1862, 238 (Mauritius). **Scarus atropectoralis** Schultz 1958, 79, Pl 15A. Schultz 1958, 92 synonymised **caudofasciatus** Gunther, with **scaber** Val., 1839, the latter having P 2, 12 and no black mark at P base. Schultz 1958, 59 distinguishes **atropectoralis n. sp.** (from **caudofasciatus** Gunther) in having P 2, 13 and entire base of P dark brown or black. However, Gunther's 1862, 238 original description of **caudofasciatus** clearly states 15 (i.e. 2, 13) pectoral rays, and base of P brown. Although Schultz examined parrotfishes in the British Museum, it is curious that he did not examine the type of **caudofasciatus** Gunther (or if he did, he does not record it). From my work in the British Museum I could not observe anything of significance to justify retention of **atropectoralis** Schultz. The Pacific **caudofasciatus** of Gunther 1909, 312, Pl 153, A & B is probably not that species, but possibly **rubrofasciatus** Smith, 1956, whose P base in the preserved fish is not markedly darker than the rest.

CALLYODON CYANOGNATHUS (Bleeker), 1849. Schultz names this **pectoralis** C & V. I cannot agree. The type is lost, and the original description does not fit the life colours. I have examined the "types" of

cyanognathus, Blkr. in the British Museum, Amsterdam and Leiden. They have P 2, 12. 6 median predorsal, 2 rows on cheek and 4-5 scales on flange, and agree reasonably well with Bleeker 1862, Pl 11, f 2. **lazulinus** Jordan & Seale, 1905(06), and my specimens differ in the broad blue anal margin. This may be a sexual difference.

CALLYODON IMPROVISUS Smith 1956, 12. Presented as distinct from related **singaporensis** Blkr., 1857, on different colour pattern, notably spotting, teeth and blue pectoral. Synonymised with **singaporensis** Blkr., by Schultz 1958, 78. I have compared a specimen with the types of **singaporensis** Bleeker in Leiden and Brit. Museum. These still show clearly spotting exactly like Bleeker 1862, Pl 13, f 1 — my specimens now show no marks at all, though corresponding in general features. True **singaporensis** has so far been found only in the Pacific, and as my fishes live so far away, and the colour pattern is clearly different, I consider it sounder to retain **improvisus** as distinct.

Callyodon urbanus n. sp. (Pl 42, J and fig. 3)

Callyodon pectoralis (non Val.) Smith 1956, 15, Pl 42, J (type). Re-examination of my specimens shows: median predorsal scales mostly 7, one with 6 has a pair of lateral overlapping scales in front; 2 series on cheek above flange, 4-5 scales in lowest row on flange. P 2, 12. Teeth bright blue, or blue-green, about half exposed, 1-2 antrorse canines above. Caudal lobes always prolonged, much more so with age. Live colour and pattern almost constant, as shown in Smith 1956, Pl 42, J, the variegated head, prominent bluish teeth, curved yellow bar on pectoral base, and fin colours immediately distinctive, even in the water. Preserved, (fig. 3) top of head and shoulder dark, lighter below eye, whole body uniform pale yellow, no sharp line of demarcation, greenish along D & A profiles, green marks on fins as shown in Pl 42. Type, 300 mm. total length, Shimoni, as in Smith 1956, Pl 42, J. This species was synonymised by Schultz 1956, 83 with **frenatus** Lacepede, which it certainly is not. It differs from Lacepede 1802, Pl 1, f 2 (Schultz lists Lacepede 1802, Pl 1, f 1 as **frenatus**) and from the diagram of Schultz, in lacking, alive or preserved, the sharp colour division between the body and the peduncle, while the green edge of the anal is always markedly wider than that of the dorsal, predorsal scales are mostly 7, and there are never less than 4 scales on the preopercle flange. This handsome fish was found from East Africa from 14°S northwards, and at various islands to Seychelles, mostly in deepish water about coral, attains 500 mm., rather rare. I cannot assign it to any known species.

Fig. 3. **Callyodon urbanus n. sp.** Type.

Several small dark brown parrotfishes from East Africa, rather rare, were in 1956 provisionally named **pindae** Smith: **malindiensis** Smith: and **dubius** Bennett. Schultz 1958, 96 united all under **aeruginosus** Val., 1839. I have examined the type(s) of **aeruginosus** in Paris — they all have 6 median preD scales: 1-3 on flange, and P 2, 13. **pindae** probably falls there, but the identity of the others is doubtful.

3D. Subgenus **Margaritodon** Smith, 1956.

Type **Callyodon verweyi** Weber and de Beaufort, 1940 = **lunula** Snyder, 1908. As defined in the key above. 2 species in the W. Indian Ocean, the type, and **africanus** Smith, 1956.

CALLYODON (MARGARITODON) LUNULA (Snyder), 1908. **Margaritodon verweyi** Smith 1956, 15, Pl 43, f 4. There is some uncertainty about this species. The original description of **lunula** Snyder, 1908, 99, states 4 predorsal scales, repeated by Schultz 1958, 54. Weber and de Beaufort state their **verweyi** to have 5 predorsal. All my specimens have 4 median predorsal, and a pair in front overlapping. Schultz (**ibid**) has placed in the synonymy of **lunula** the species **Pseudoscarus rostratus** Gunther, 1909 from Society Island, the type lost. Having regard to Gunther's illustration and description, this opinion, without a supporting statement, is quite incomprehensible.

5. Genus **Chlorurus** Swainson, 1839.

Pseudoscarus Bleeker, 1861, is a synonym. Type **Scarus gibbus** Ruppell, 1828. Characterised as in key above, chiefly 3 series of scales on cheek, flange below naked, 4 predorsal, P 2, 14-15, nostrils small, circular, separate, hinder little larger with age. 5 species described fall here: viz. **gibbus** Ruppell, 1828: **microrhinus** Bleeker, 1854: **strongylocephalus** Bleeker, 1854: **microcheilus** Bleeker, 1861: **ultramarinus** Jordan & Seale,

1906. As noted elsewhere, Schultz incomprehensibly linked **muricatus** Val. with **gibbus** Ruppell, then grouped the other four under **microrhinus** Bleeker, which is questionable. The living fishes of this group are striking objects — in East Africa we saw many alive, and handled more while fresh. None were marked like Bleeker's **microrhinos** 1862, Pl 3, but **strongylocephalus** Blkr. (Smith 1956, Pl 42, C & F) was abundant, and almost constant in markings at each size, the changes in markings which occur with growth, chiefly marks on fins, show in Smith 1956, Pl 42, C & F. The head is distinctive at all stages in males, dark above eye, whole cheek light, edges of lips blue or green (never red), a short blue or green bar across front of snout. In most parts we found **microcheilos** Blkr., as shown in Smith 1956, Pl 44, G, always recognisable by the yellow green-margined caudal. The two forms were found together, but **strongylocephalus** was more abundant in East Africa, while at Seychelles **microcheilos** predominated. Only after my work was complete did I suspect that **strongylocephalus** might be the male and **microcheilos** the female of the same species. My preserved fishes do not help in this, but Mr. F. Williams of Zanzibar has kindly examined a few specimens in Zanzibar and has found one **strongylocephalus,** a male, and 2 of **microcheilos,** both females.

Among hundreds of **Chlorurus** specimens in the W. Indian Ocean we found not one that agreed with **microrhinos** Bleeker, 1862, Pl 3, and consider this distinct from **strongylocephalus** Blkr., 1854. Jordan and Seale 1905, 332 (Samoa) list **microrhinos** Blkr., and **strongylocephalus** Blkr., describing **ultramarinus** as new, but have given colour descriptions of the latter which indicate that they had confused species, most of their descriptions point to **microrhinos.** Examination of the type and co-type of **Scarus gibbus** Ruppell, 1828 in Frankfurt has fully established the validity of Ruppell's and Klunzinger's original descriptions, and that this fish cannot, by any stretch of imagination, be the same as **muricatus** Valenciennes. While **strongylocephalus** Blkr. is virtually identical with **gibbus** Ruppell, I prefer at present to keep them separate, and 3 species in this genus may be recognised.

I. Forehead in large males to almost over snout. Straight green bar from angle of mouth to edge of opercle, head above this dark. Edges of lips red. Pelvics green ..... **microrhinos**

II. Forehead not to above snout. No straight green bar from angle of mouth to opercle. Lips edges blue or green :

A. 2 red spots on chin. Most of head purple. Pelvics blue ..... **gibbus**

B. No red spot on chin. Head above eye purple, whole cheek light. Males with bar across front of snout. Pelvics pink ..... **strongylocephalus**

CHLORURUS MICRORHINOS (Bleeker), 1854, 200 and 1862, 22, Pl 3. **Callyodon ultraminarinus** (in part) Jordan & Seale 1906, 63, f 16. **Scarus microrhinos** (in part) Schultz 1958, 48, f 4, Pl 9A. Bleeker's type in Leiden, 460 mm. length, examined; also 300 mm. std. length **microrhinos** Bleeker, one of Bleeker's types (B.M. 1862.2.28.54), British Museum: both agree with Bleeker 1862, Pl 3, the green (light) line from angle of mouth to operculum distinct. I have never seen this fish in W. Indian Ocean, but Roux-Esteve 1956, 94 records **microrhinos** Bleeker, from the Red Sea, his brief description agreeing with Bleeker 1862, Pl 3, except that green band stated from upper lip to operculum, Bleeker shows this from lower lip, possibly artistic deduction from a not quite fresh fish, in Bleeker's type it joins both.

Fig. 4. Head of type of **Chlorurus microrhinos** (Blkr.). Note distinct streak along lower cheek. (Photo: Dr. M. Boeseman).

CHLORURUS GIBBUS (Ruppell), 1828. Smith 1958, 16. **Scarus gibbus** Ruppell 1828, 81, Pl 20, f 2. Klunzinger 1871, 568. The type, 440 mm., cotype, 460 mm., length, SMF 2686, Senckenberg Museum; Frankfurt: both have 4 predorsal scales, 3 rows on cheek (19-20 total), flange naked (clearly stated by Klunzinger 1871, 568). P 2, 14. Large upper canine. Dorsal with narrow light line along base, middle and edge. The gibbosity of Pl 20, f 2 has shrunken (stated by Ruppell to be cartilage). Ruppell 1828, Pl 20, f 2, and the pattern still visible on the types, show overall accord with **strongylocephalus** Bleeker, except that in the latter, fishes of size of types of **gibbus** do not have a line along mid dorsal, it has by then broken into spots. It could be that the colours and pattern in Ruppell 1828, Pl 20, f 2 were partly deduction from a faded specimen, and it will not be surprising if **gibbus** eventually proves to be the same as **strongylocephalus** Blkr., or **microrhinos** Blkr.

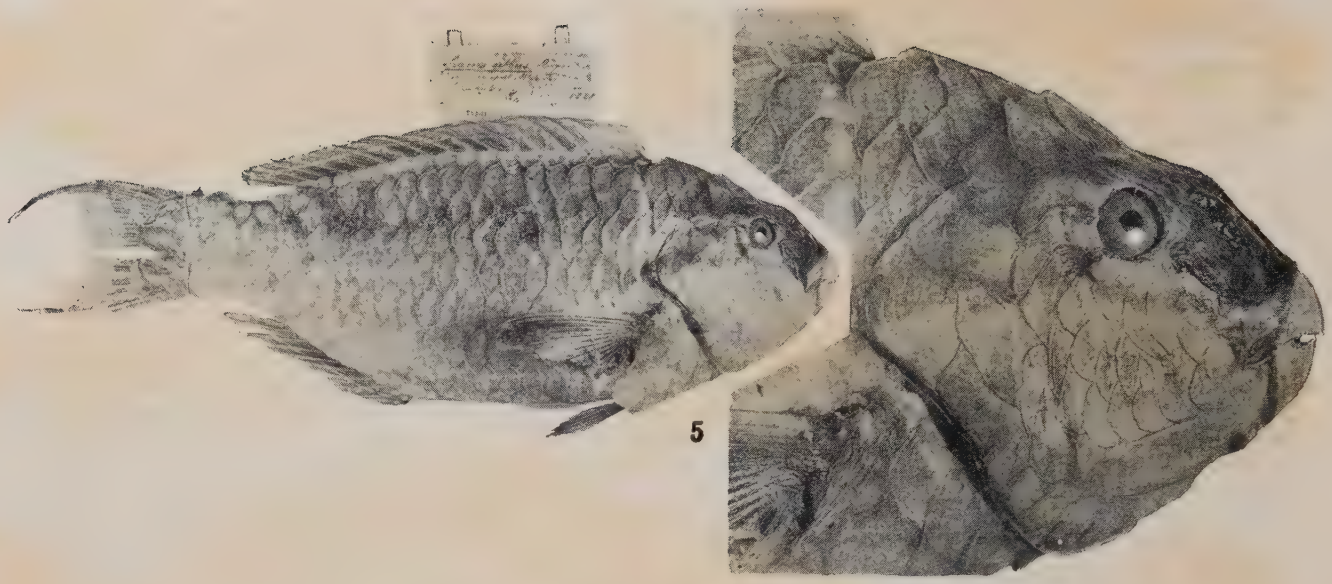

Fig. 5. **Chlorurus gibbus** Ruppell, Type, 440 mm. (Photo: Dr. W. Klausewitz).

CHLORURUS STRONGYLOCEPHALUS (Bleeker), 1854. **Scarus s.** Bleeker 1854, 439; and 1862, 24, Pl 4, f 3. ?**Scarus microcheilus** Bleeker 1861, 231 and 1862, 24, Pl 4, f 2. **Chlorurus strongylocephalus** Smith 1956, 16, Pl 42, C, F. ?**C. microcheilos** Smith 16, Pl 44, G. **Scarus microrhinus** (in part) Schultz 1958, 48. Full definition of this species is given in the illustrations in Smith 1956, Pls 42, 44. The evidence that **microcheilos** is the female is not yet fully established, but appears likely.

4. **Cetoscarus** Smith, 1956.

Type **Scarus pulchellus** Ruppell, 1835. As outlined in the key, a well-defined genus, but one of the genera which Schultz 1958, 15 condemned as a result on my part "of an inadequate study of the generic relationships of Parrotfishes," now more firmly established than before by Schultz's own work. Ignoring the published identity of **gibbus** Ruppell, Schultz assigned characters to that species, in association with **pulchellus** Ruppell, and **bicolor** Ruppell, in the genus **Chlorurus** Swainson, which do not pertain to that genus, but are clearly those of **Cetoscarus** Smith. There are 2 species, the type, and **bicolor** Ruppell, 1828, both ranging from E. Africa to the central Pacific, remarkably similar, **pulchellus** has spots on the head and grows to a large size, **bicolor** is smaller and never seems to have spots on the head. It is not impossible that they are merely sexual dimorphs, or growth stadia, as very small **pulchellus** are unknown.

CETOSCARUS PULCHELLUS (Ruppell), 1828 (**Pl 43, E**). Smith 1956, 17, Pl 43, E. I have examined Ruppell's type in Frankfurt, a mounted fish 490 mm. length, smaller than any living fishes seen in E. Africa. 6 median predorsal scales, the front 3 small, 3 rows on cheek, 6-6-6, flange naked. P 2, 12. Spots on head and shoulders, very like adult **bicolor,** but that apparently never has spots on head.

CETOSCARUS BICOLOR (Ruppell), 1828. Smith 1956, 17, Pl 44, fs C, D, E. **Pseudoscarus nigripinnis** Gnthr., 1866, 103, Pl 15, f 2. This species is widespread but not abundant in the W. Indian Ocean, and alters markedly with growth. Schultz 1958, 29 accepts **nigripinnis** Gunther, 1866 as distinct from **bicolor** Ruppell, chiefly "in that **bicolor** has 4 or more scales in the ventral row on cheek whereas **nigripinnis** has only 2 scales." Gunther's description states "2 or 3 scales" in lowest row, his illustration shows 3; we found undoubted **bicolor** to have normally 3-6, but as few as one. In the field we observed the **"nigripinnis"** form as one of the growth mutations of **bicolor,** it is almost certainly not a valid species. Of **nigripinnis** Schultz 1958, 29 states: "types examined in British Museum" but a few lines later "I have not seen a specimen of this species." I examined Ruppell's type in Frankfurt and those of **nigripinnis** in the British Museum, and could find nothing to justify distinction for **nigripinnis.**

6. **Hipposcarus** Smith, 1956.

Type **Scarus harid** Forskal, 1775. Defined as in the key above. In this genus even the very young fishes are colourful, there is no brown phase.

The **Scarus harid** of Forskal, 1775.

The name of **harid** Forskal, 1775 for a Parrotfish from the Red Sea, has been used largely because Ruppell, 1828 and Klunzinger, 1871 both confirmed its application to a species well-known there. Forskal's type, now in Copenhagen, does not seem ever to have been described. It is a light coloured skin, of a young

PLATE 43

A. & B. *Xanothon capistratoides*, two phases, 11 ins. and 12½ ins. C. *Callyodon niger*, 9 ins. D. & F. *Callyodon (Margaritodon) lunula;* D, 10 ins., F, 12 ins.; above head of 18 inch fish. E. *Cetoscarus pulchellus*, 36 ins. F. See D. G. *Callyodon niger*, 16 ins. H. *Callyodon ghobban*, 22 ins. I. *Callyodon rubrofasciatus*, 18 ins. J. *Callyodon rubroviolaceus*, 11 ins.

fish about 215 mm. std. length. Most of the diagnostic part of the head is missing. It seems to have only 4 median preD scales, P 2, 13. L.ls. 17/10, quite separate, the lower starting well in advance of end of upper. tubes little branched, peduncle depth about 8.5 in std. length. It could be the same as the fish I have described (Smith 1956, 17, Pl 44, A & B) from East Africa as **harid** Forskal. In that event it is almost certainly not the sole basis of Forskal's 1775, 30 description, for he states upper canines present, and much of his data indicates an adult male. However, the sum of the evidence from this type relic, from the original description, from the descriptions, data, and general information about the species given by Ruppell and Klunzinger, and from my knowledge of this form gained in the W. Indian Ocean, leads me to recommend that as far as the Red Sea is concerned, **harid** Forskal, 1775 be accepted as sufficiently defined.

Fig. 6. The type of **Scarus harid** Forskal. Actual length 220 mm. (Photo: Zool.Mus.Copenhagen).

Following Ruppell 1828, two clearly related forms, viz. **harid** Forskal and **mastax** Ruppell, 1828 have received doubtful recognition, as from then on there has never been any really reliable accurate description and illustration of either from the Red Sea. Possibly because both Ruppell himself, and Klunzinger, were doubtful of the specific distinction of **harid** and **mastax**, most recent workers have united them, and under the name of **harid** fishes have been recorded from a wide area of the Indo-Pacific. During our work in East Africa we found a striking, longsnouted Parrotfish that closely resembles **mastax** Ruppell, 1828, but with different markings. Always associated, usually in greater numbers, was a generally smaller, unusually milky-white Parrotfish, very like **harid** of Ruppell, 1828. This was closely related to **mastax**, for each had similar, characteristic, and unusual cheek scaling. The shape and light colour of these two forms set them apart from all other Parrotfishes in East Africa. Cheek scales in the 2 E. African forms are notably small, and form a rather narrow triangular group, the preopercle flange below always naked, with a naked suborbital area deeper than in most other species. In fishes up to about 60 mm. these scales are in 3 rows behind. Beyond this, extra scales appear, and in fishes beyond 80 mm. there are 4 rows, sometimes 5 scales in the 2 last vertical rows. On the cheek, scale counts in the rows are, from above: Row 1, 8-9; 2, 6-8; 3, 6-7; 4, 3-5. Total 25-29. Even fishes of 60 mm. length have 25 scales. In all but juveniles, the maximum depth of this scaling, measured from the lower apex near the preopercle angle, to the upper edge below the eye, is always less than the I-orb width, and never more than half depth of head below lower edge of eye.

Ruppell's 1828, Pl 21, f 2 of **mastax** shows 2 rows of scales on the cheek and a 3rd on preopercle flange. However, I have examined Ruppell's types of **mastax** in Frankfurt, the larger 450 mm., the cotype 390 mm. Both are clearly males, with canines and long caudal filaments, 4 median predorsal scales, and P 2, 13. The type has cheek scales in 4 rows behind, total 23, the cotype in 3 rows behind, total 19, both with flange naked (Klunzinger 1871, 561 indicates Ruppell 1828, Pl 21, f 2 as in error in showing scales on preopercle flange).

Although both **harid** and **mastax** have been recorded from a wide area in the W. Pacific, there have been no certainly reliable descriptions or illustrations of specimens from those parts, even Bleeker's (q.v.) are suspect. Specimens from that area have been identified as **harid** Forskal, or as **mastax** Ruppell, but workers appear to have been in doubt about their material, and the evidence indicates confusion of species. Weber and de Beaufort e.g. 1940, 277 state **harid** Forskal, from the Indo-Australian region, to have 5-6 preD scales (instead of 4), while Fowler & Bean 1928, 421 unite **nigripinnis** Gunther, 1866 (Zanzibar), with **harid** (Philippines), whereas it is clearly **bicolor** Ruppell.

Bleeker 1862, 35, Pl 10, f 2 describes **mastax** from Java. I found his type, 495 mm. length, in Leiden. It agrees well with his 1862, Pl 10, f 2, except that his artist shows 23 scales on cheek, the type has 29, in 4 rows behind. In the British Museum I examined specimens from Seychelles, Cocos and an uncertain locality, that showed no significant difference from Bleeker's 1862 type. It may, therefore, be accepted that **harid** Forskal, as hitherto defined, occurs over the Indian and W. Pacific Oceans.

In our work in the W. Indian Ocean we got large numbers of "**harid**." From the beginning I was puzzled by certain constant differences in markings from the descriptions of Ruppell and Klunzinger (and

Ruppell 1828, Pl 21, f 1 & 2): both state Red Sea fishes have a yellow line from rictus to operculum: several lines of blue spots along mid side above anus, and the body of the caudal uniform: the only recent account of **harid** from Red Sea is one of a few lines by Roux-Esteve 1956, 94: he mentions this yellow line on the cheek, and the uniform dark violet caudal. In the W. Indian Ocean I constantly searched for specimens marked like those from the Red Sea, but among many hundreds, none had the yellow line on the cheek, or blue spots on the side, while all males had either 2-3 prominent lines across the body of the caudal, or, much more commonly, a blue circled pinkish area with blue spots; also from the rictus back, all males had a sharp line of division between the darker upper and lighter lower parts of the head, all this as in Smith 1956, Pl 44, B. It is not uncommon for Red Sea forms to differ from others by small but constant features or markings, and this seems to be the case here. I am, therefore, giving expression to these differences by sub-specific rank, as outlined below.

In his revision of the Parrotfishes, Schultz 1958, has accepted as **harid** Forskal, specimens ranging from the Red Sea to the central Pacific. I have long suspected that proper investigation might reveal that the **Hipposcarus** group is not as simple as has been thought. Schultz 1958, Pl 9B shows a Philippine specimen, which seemed to confirm my suspicions. I therefore asked for a specimen from the Pacific, and he kindly sent me two, 275 mm. and 390 mm. total length respectively, from Philippines. These agree with the data and illustration of Schultz, but show divergences from the common form of the W. Indian Ocean (and of the Red Sea). The difference in general appearance is apparent at sight, and it seems likely that this is another species, to which I have given expression here, for as far as my material goes, the 2 forms appear to be distinguishable as follows :

A. Cheek scales usually in 4-5 distinct rows behind, rarely 3, 23-29 scales in all on cheek. Maximum depth of cheek scaling below eye markedly less than interorbital, and less than half depth of head below eye. 2-5th cheek scales in upper row with exposed portion less than eye. Inner lip joins outer nearer snout tip than rictus. Depth $2\frac{3}{4}$-3 ..... **harid**

B. Cheek scales always in 3 rows, 19-22 scales in all on cheek. Maximum depth of cheek scaling below eye exceeds interorbital, exceeds half depth of head below eye. 2nd-5th cheek scales in upper row with exposed portion not less than eye. Inner lips joins outer nearer rictus than snout tip. Depth $2\frac{1}{2}$ ..... **schultzi n. sp.**

In addition, there is distinction in live colours. **H. harid** notably shows a light background, and pink shades, unusual in parrotfishes, **schultzi** is apparently darker, also as preserved.

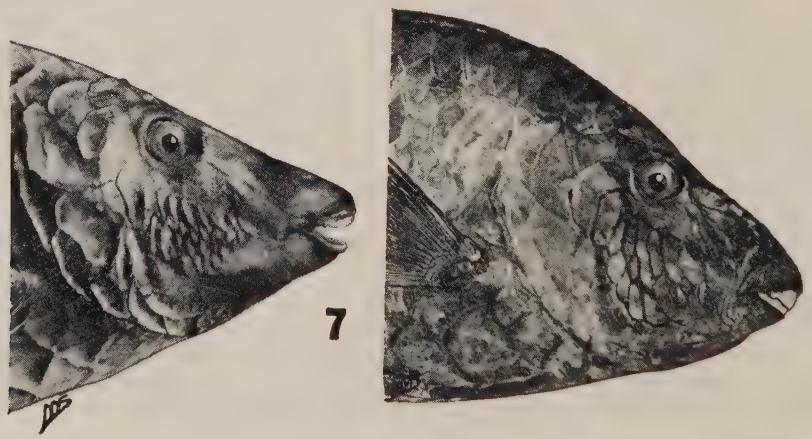

Fig. 7. Cheek scales of types : left, **harid vexillus n. subsp.**; right, **schultzi n. sp.**

Hipposcarus harid (Forskal), 1775.

The following 2 subspecies are recognised :

I. Yellow line from rictus to operculum: lines of blue spots on mid side above anus: body of caudal uniform ..... **subsp. harid**

II. In males, head darker above, contrasted, sharply divided, lighter below: no blue spots on side: body of caudal with bars, or blue-bordered pinkish area enclosing blue spots ..... **vexillatus n. subsp.**

HIPPOSCARUS HARID HARID Forskal, 1775. **Scarus harid** Forskal, 1775, 30 (Arabia). Klunzinger 1871, 561 (Red Sea). **S. mastax** Ruppell 1828, 80, Pl 21, f 2 (Red Sea). Klunzinger 1871, 562 (Red Sea). Roux-Esteve 1956, 94 (Red Sea). Defined as above: apparently Red Sea only, stated to be abundant and to reach 450 mm. Dr. W. Klausewitz of Frankfurt informs me that he saw many adult males of **harid** underwater in the Red Sea, they were generally greenish above.

Hipposcarus harid vexillus n. subsp. (**Fig. 9**, juv.).

?**Pseudoscarus mastax** Bleeker 1862, 35, Pl 10, f 2 (Java). **Callyodon harid** (in part) Fowler & Bean 1928, 420 (Philippines). Weber and de Beaufort 1940, 276 (in part). **Hipposcarus harid** Smith 1956, 17, Pl 44, A & B. Type, male, 440 mm. length, 325 mm. standard length, Shimoni. 4 predorsal scales. P 2, 13. Cheek scales as described in key above (and fig. 7): small juveniles to about 100 mm. show 3 rows on cheek behind, closely adjacent to lower orbital margin. Sexual dimorphism becomes apparent only beyond about 150 mm. length, the males with longer and narrower snouts, profile concave before eye. Small juveniles to 60 mm. have truncate caudal, gradually emarginates, adult males with long filaments. The basic ground colour of both sexes is an unusual milky blue-white, the males usually more brilliant, both sexes in colour in Smith 1956, Pl 44, the male the most brilliant specimen seen, usually lighter. Small juveniles to about 90 mm. are in life grey-blue above, with pink sheen, and a ½ eye width bright red stripe from eye back, ending in a little less than eye-size blue spot at caudal base. Below this stripe lighter, milky yellow, ventral surface irregularly dead white. Edges of lips red, muzzle yellowish, iris yellow, with red and blue ring. Dorsal yellow, margin scarlet, anal yellowish, pectoral translucent, pelvic yellow, with basal red spot. Caudal yellow, with pink suffusion, upper and lower margins dusky. Juveniles (fig. 9), preserved (formalin), mottled, some with light stripe from eye to dark spot at Cd base, this still apparent at 100 mm. length, at which upper and lower caudal margins dusky, these distinct to 200 mm. We saw no specimens markedly greenish, as seen (above) in those in Red Sea, but some had edges of D scales greenish. This form not rare over whole W. Ind. Ocean, from Bazaruto to Seychelles and Mauritius, rarely exceeds 500 mm. One, 750 mm., length, Mauritius, male with canines (recorded as **gibbus** Ruppell, by Baissac 1956, 344; photograph kindly sent by Dr. J. Vinson), shows some degree of nuchal gibbosity. Day 1878, 411, described **harid** Forskal, from India and Malay Archip., but he possibly never saw a live specimen, or none at all, his data clearly compiled. Bleeker's 1862, Pl 10, f 1 **mastax** from Java appears to be this form. Fowler & Bean 1928, 422 comment on absence of yellow line on cheek from Philippine specimens, and do not mention blue spots on side.

Hipposcarus schultzi n. sp. (Fig. 8).

Scarus harid (**non** Forskal) Schultz 1958, 50, Pl 9, B. Possibly also Fowler & Bean (in part) 1928, 420; and Weber and de Beaufort, 1940, 276. 4 predorsal scales. 3 rows on cheek, as follows, upper 8-9; 2nd 8; lowest 3-5; total 19-22, the naked area below eye markedly shallower than in **harid** Forskal, further as in the key above. P 2, 13. Gillrakers 24-30+35-36. The type from Philippines, 370 mm. length, U.S.N.M., No. 9270.

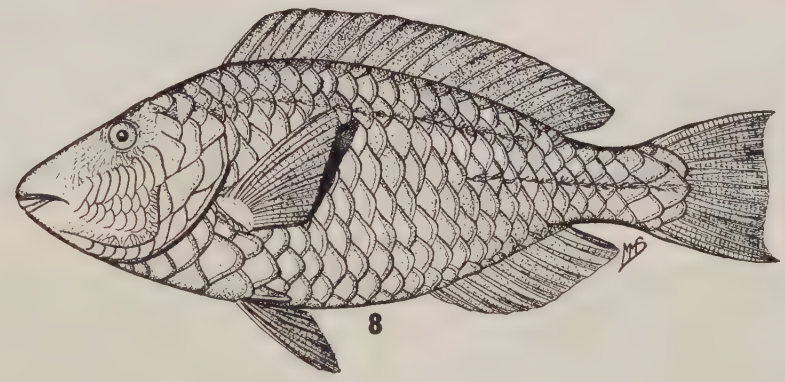

Fig. 8. **Hipposcarus schultzi n. sp.** Type.

According to Schultz 1958, 51, live colours of a Philippine specimen are "Head purplish grey, edge of upper lip orange; streaks about eye pink to orange; scales on head and body margined with purplish pink, centres greenish dorsally, changing to light yellowish orange on sides; underside of head with yellowish orange; distal edge of dorsal and anal fins blue, as are the outer rays of caudal fin; central part of caudal fin reddish brown, as is dorsal part of pectoral fin; membranes of dorsal and anal fins between the rays with blue spots. In a specimen from Saipan the caudal peduncle is bright yellow." Possible names for this species are **longiceps** Valenciennes, (Waigau, Pac.), and **macrocheilos** Bleeker, 1854 (Halmahara, Pac.). The type of **longiceps,** a dried skin of a half-grown fish, collected by Quoy and Gaimard, was described and identified as **harid** Forskal by Guichenot 1865, 42, (whose work was not noticed by Schultz). Dr. J. Guibe of Paris informs me that the type of **longiceps** Val., has since been destroyed. As the original description is also not clearly diagnostic here, this name is rejected. The type of **macrocheilos** Bleeker, (B.M.) only 110 mm. length, has 3 series of scales below the eye, the flange naked, but is too young a stage for specific definition as here accepted. A 275 mm. fish from Pelew islands (B.M. No. 74.11.18.4), and one 350 mm. from Ponape (B.M. No. 81.10.20.89), both named "**harid**" appear to fall here. Named in honour of Dr. L. P. Schultz.

This systematic picture of **Hipposcarus** is presented tentatively. For a complete understanding of the obvious complexity of form, it will be necessary to examine fresh material in the Red Sea and the Pacific, sexing each specimen.

It may be noted that under **harid** Forskal, Schultz 1958, 50 grouped as well; **psittacus** (**non** Linn) Forskal, and **apridentatus** Smith, 1956 (q.v.).

REVISED LIST OF THE PARROTFISHES OF THE WESTERN INDIAN OCEAN

(Largest known size stated)

A full list of all, including doubtful records, of Parrotfishes of the W. Indian Ocean will be found in Smith, Ich.Bull. No. 1, 19-21. Certain revisions of the synonymy will be found in the present index.

Xanothon Smith, 1956.

Type **Callyodon bipallidus** Smith, 1956. 4 median predorsal scales, 2 rows on cheek, flange naked.

XANOTHON BIPALLIDUS Smith, 1956, **Pl 41, D** (Pinda). P 2, 13. 15-20 rakers. Teeth greenish, canines feeble or absent. 24 ins. Whole W. Ind.Ocean to Natal, Red Sea.

XANOTHON FOWLERI Smith 1956, **Pl 42, G** (Pinda). P 2, 12. 20+30-50 rakers. Teeth pink, basally blue, 1-2 upper and lower canines. 18 ins. Red Sea, whole W. Ind. Ocean to 16°S.

XANOTHON CAPITANEUS (Val.), 1839. **Pl 41, F** (Pinda). P 2, 13. 25+35 rakers. Teeth green below, edges white and pink, 2-3 small upper, no lower canines. 15 ins. W. Ind. Ocean to 15°S, Mauritius.

XANOTHON CHLOROMELAS (Gnthr.), 1865, Pl XV, f 1 (Zanz.). P 2, 13. Teeth bluish, 1-2 upper, no lower canines. 12 ins. Zanzibar.

XANOTHON BATAVIENSIS (Blkr.), 1857. **Pl 41, A** (Shimoni). P 2, 12. 14+28 rakers. Teeth pink, 1-3 upper, 1-2 lower canines. 24 ins. Whole W. Ind. Ocean to 15°S, Red Sea, Mauritius, to mid Pacific.

XANOTHON CAPISTRATOIDES (Blkr.), 1862. **Pl 43, A, B** (Shimoni). P 2, 13. 17-19+25-30 rakers. Teeth pink, edge white, 2-3 wide-flaring upper canines. 12 ins. W. Ind. Ocean to 14°S, to mid Pacific.

XANOTHON CARIFANUS Smith 1956, **Pl 42, D** (Shimoni). P 2, 12. 20+33-35 rakers. Teeth pink, 1-2 small upper canines. 12 ins. W. Ind. Ocean to 14°S.

XANOTHON RHODUROPTERUS (Blkr.), 1861. **Pl 44, K** (Shimoni). P 2, 13. 20+30 rakers. Teeth bluish, 1 stout upper canine. 12 ins. W. Ind. Ocean to Pacific.

XANOTHON VENOSUS (Val.), 1839. **Pl 44, H** (Bazaruto). **Scarus taeniurus** (Val.), 1839. **Scarus pentazona** Blkr., 1861. **Xanothon pentazona** Smith, 1956. P 2, 12. 17+30 rakers. Teeth pink, no canines. 12 ins. W. Ind. Ocean to Pacific.

XANOTHON OKTODON (Blkr.), 1861. **Pl 41, K** (Poivre Is.). P 2, 12. 21+22 rakers. Teeth brown-red. 1-2 canines each jaw. 14 ins. W. Ind. Ocean to Pacific. Schultz considers this = **bataviensis** Blkr., it may be a sexual dimorph, at present held distinct, as we have this brown fish at greater lengths than coloured **bataviensis.**

XANOTHON MARGARITUS (Cartier), 1874. Smith 1956, 7, Pl 45, G. P 2, 12. 18-20+35-37 rakers. Teeth red, no canines. 12 ins. W. Ind. Ocean to 21°S, Pacific.

XANOTHON ERYTHRODON (Val.), 1839. Smith 1956, 7, Pl 45, F. P 2, 13. 14-16+28-33 rakers. Teeth pink or red, no canines. 8 ins. Vast shoals in W. Ind. Ocean to 21°S, Pacific.

Bolbometopon Smith, 1956.

Genotype **Scarus muricatus** Val., 1839. With characters of species.

BOLBOMETOPON MURICATUS (Val.), 1839. **Pl 42, H** : and **Pl 45** (Shimoni). **Callyodon muricatus** Smith 1953, 620, Pls XV, XVI. **Chlorurus gibbus** (**non** Ruppell) Schultz 1958, 26, Pl 7. 4-5 median preD scales, 2 rows on cheek, 2 scales on flange. P 2, 14. 8-10 stout rakers. Changes greatly with age, occiput becomes swollen, always flat in front. One of the largest species, grows to 150 lbs. or more. Red Sea. W. Ind. Ocean to 20°S, to Pacific. Moves in great shoals in deep water, some caught on lines in 80 fms.

Callyodon (Gron.) Scop. 1777.

Genotype **Calliodon lineatus** Blch.-Schn., 1801 = **Scarus croicensis** Bloch, 1790. 2 rows of scales on cheek, and some on flange below. 4 subgenera.

CALLYODON (YPSISCARUS) VIRIDIFUCATUS Smith, 1956. **Pl 42, B & I** (Shimoni). 3 median preD scales; 2-3 on flange. P 2, 12. 12-13+25-27 rakers. Teeth white or pink, 1-2 upper, 1-3 larger lower canines. 10 ins. W. Ind. Ocean to 14°S.

CALLYODON (SCAROPS) RUBROVIOLACEUS Blkr., 1849. **Pl 43, I** (Shimoni). 7 median preD scales; 2-4 on flange. P 2, 13. 21+28 rakers. Teeth red-brown, 1-2 small upper canines. 18 ins. Mid tropical W. Ind. Ocean, to Pacific.

Subgenus **Callyodon**

CALLYODON GHOBBAN (Forskal), 1775. **Pl 43, H** (Inhaca). **Scarus guttatus** Schn. 1801. 6 median preD scales: 1-2 on flange. P 2, 13. 18+25-30 rakers. Teeth white: rarely 1 small upper canine. 40 ins. One of the commonest in W. Ind. Ocean, from 28°S, to Pacific. Without proof, I suggest **ghobban** and **guttatus** as sexual dimorphs.

PLATE 44

A. & B. *Hipposcarus harid vexillus*; A, fem, 9 ins.; B, male, 20 ins. C. *Cetoscarus bicolor*, $3\frac{3}{4}$ ins. D. Same at 9 ins. E. at 18 ins. F. *Callyodon apridentatus*, 32 ins. G. *Chlorurus strongylocephalus*, fem., 11 ins. H. *Xanothon venosus*, 10 ins. I. *Callyodon falcipinnis*, 21 ins. J. *Callyodon madagascariensis*, 7 ins. K. *Xanothon rhodurus*, 10 ins. L. *Callyodon globiceps*, 7 ins.

CALLYODON CAUDOFASCIATUS (Gnthr.), 1862. 6 median preD scales: 3-4 on flange. P 2, 13. Teeth whitish, no canines. 3 cross bars on hind half body, base P dark. 15 ins. Zanzibar, Mauritius.
CALLYODON RUBROFASCIATUS Smith, 1956. **Pl 43, I** (Shimoni). 7 median preD scales; 2-4 on flange. P 2, 13. 21-28 rakers. Teeth red-brown, 1-2 small upper canines. Only the type, 18 ins., Shimoni.
CALLYODON SCABER (Val.), 1839. Pl 41, G (Pinda). 6-7 median preD scales; 3 on flange. P 2, 12. 18+33 rakers. Teeth white, no canines. 9 ins. W. Ind. Ocean from 26°S, to Pacific.
CALLYODON SEXVITTATUS (Ruppell), 1828. **Pl 41, H & I, fig. 2. C. upolensis (non** J & S), Smith 1956, 11. **Scarus randalli** Schultz 1958, 97, Pl 19 C, 27 A. 6 median preD scales: 4-5 on flange: P 2, 12. 20+36-40 rakers. Teeth pink, no canines. 12 ins. Red Sea: W. Ind. Ocean to 14°S, to Pacific.
CALLYODON MADAGASCARIENSIS (Steindachner), 1888. **Pl 44, J** (Pinda). 7 median preD scales: 4-5 on flange. P 2, 12-13. 18+30-33 rakers. Teeth blue, small upper canine. 12 ins. W. Ind. Ocean to 14°S.
CALLYODON FRENATUS (Lacepede), 1802. **Pl 41, C** (Shimoni). **Callyodon vermiculatus** Smith 1956, 11, Pl 41, C. **Scarus frenatus** (part), Schultz 1958, 83, fig. 13. 6-7 preD scales: 2-4 on flange. P 2, 12. 18+40 rakers. Teeth green, 1-2 small upper canines. 14 ins. Red Sea, W. Ind. Ocean to 14°S, possibly Pacific.
CALLYODON IMPROVISUS Smith 1956. **Pl 41, E** (Seych.). 6 preD scales: 2 on flange. P 2, 13. 20+40 rakers. Teeth white or pink, no canines. 13 ins. W. Ind. Ocean to 14°S.
CALLYODON SINGAPORENSIS (Blkr.), 1851. Bleeker 1862, 31, Pl 13, f 1. Schultz (part) 1958, 78, Pl 14, D. 6 median preD scales; 2 on flange. P 2, 13. Teeth green, no canines. 14 ins. Madagascar? Pacific.
CALLYODON FALCIPINNIS (Playfair), 1867. **Pl 44, I** (Shimoni). 6 median preD scales; 1-2 on flange. P 2, 13. 25+36 rakers. Teeth blue green, 2-3 upper canines. 21 ins. W. Ind. Ocean. Schultz 1958, 75 puts this with **globiceps** Val., but that has P 2, 12. I suspect this to be rather a sexual dimorph of **janthochir** Bleeker.
CALLYODON NIGER (Forskal), 1775. **Pl 43, C, G** (Zanzibar). 6-7 median preD scales; 3 on flange. P 2, 12. 15+28 rakers. Teeth blue-green, 1-2 small upper canines. 16 ins. Red Sea, W. Ind. Ocean to 14°S, Pacific. Forskal's type, a dried skin, 280 mm. total length, in Copenhagen, in good condition.
CALLYODON LEPIDUS (Jenyns), 1842. **Pl 41, J** (Shimoni). **C. viridibusius** Smith 1956, 13, Pl 41, J. 6-7 median preD scales: 3-5 on flange. P 2, 12. 18-30 rakers. Teeth pink, rarely one small upper canine. 16 ins. W. Ind. Ocean to 14°S, Pacific.
CALLYODON MUS Smith, 1956. **Pl 41, B** (Shimoni). 6 median preD scales: 4 on flange. P 2, 12. 21+38 rakers. Teeth pink, no canines. 9 ins. Shimoni, only the type.
CALLYODON CYANOGNATHOS (Blkr.), 1849. **Pl 42, K** (Shimoni). **C. lazulinus** Smith 1956, 13, Pl 42, K. **S. pectoralis** Schultz 1958, 99, Pl 19, D. 6 median preD scales: 3-4 on flange. P 2, 12. Teeth blue, no canines. 18 ins. W. Ind. Ocean to 14°S, Pacific.
CALLYODON GLOBICEPS (Val.), 1839. **Pl 44, L** (Shimoni). Schultz 1958, 75, Pl 14, C. 6 median preD scales: 2-3 on flange. P 2, 12. 13-15+28 rakers. Teeth blue, 1-2 canines each jaw. 20 ins. W. Ind. Ocean to 14°S, Pacific. Adults have large globose head.
CALLYODON SPEIGLERI Smith, 1956. **Ps. dussumieri (non** Val.), Blkr., 1862, Pl 8, f 1. **Sc. dussumieri (non** Val.) Schultz, 1958, 100 (in part and ?). 6 median preD scales: 2 on flange below. P 2, 13. Teeth white, canine each jaw. 18 ins. W. Ind. Ocean(?) to Pacific, rare (See earlier discussion this species).
CALLYODON APRIDENTATUS Smith, 1956. **Pl 44, F** (Malindi). **Sc. harid (non** Forsk.) Schultz 1958 50. 6-7 median preD scales: 1-2 on flange. P 2, 13. Teeth white, 2 strong upper canines. 36 ins. Mid tropical W. Ind. Ocean, rare.
CALLYODON JANTHOCHIR (Blkr.), 1852. **Ps. janthochir** Bleeker 1862, 30, Pl 5. 6 median preD scales: 2-3 on flange. P 2, 13. Teeth green, canines, or none. 24 ins. Mauritius?, Pacific. I suspect confusion of **globiceps** and **falcipinnis** (q.v.).
CALLYODON URBANUS n. sp. Pl 42, J, fig. 3. C. pectoralis (non Val.) Smith 1956, 15, Pl 42, J. 6-7 median preD scales; 4-5 on flange. P 2, 12. Teeth blue, 1-2 upper canines. 21 ins. W. Ind. Ocean.
CALLYODON FORMOSUS (Val.), 1839. Schultz 1958, 56, Pl 10, C. In the British Museum is a specimen of this species from Mauritius (1941.4.31.28), length 275 mm. It has 4 median predorsal scales, a pair overlapping in front, 2 rows on cheek, and 2(1-3) on flange below, virtually whole cheek area scaly. P 2, 12. Cd tips little extended. Canine in each jaw, flaring out and back, upper smaller. Markings faded, D & A lighter basally, distal half dusky. Previously known from central Pacific, this is first record from Indian Ocean.
CALLYODON AERUGINOSUS (Val.), 1839. **C. pindae** Smith 1956, 11, Pl 45, I. 6 median preD scales: 1 on flange. P 2, 13. 19+36 rakers. Teeth pink, no canines. Brown, free part of peduncle light. 8 ins. Red Sea, Pinda, Maur.
CALLYODON MARSHALLI (Schultz), 1958, 88, f 24. **Fig. 10.** Not seen. 6-7 median preD scales; 1-4 on flange. P 2, 13. Teeth green, 2 upper canines. Live colours unknown; preserved, marked as fig. 10. 15 ins. Red Sea, 3 specimens. But for P 2, 13 I should regard this as faded **lazulinus** J & S (= **cyanognathos** Blkr.) with which general characters accord.

Subgenus **Margaritodon** Smith, 1956.

Type **C. verweyi** Weber & de Beaufort, 1940 = **lunula** Snyder, 1908. 4-5 median preD scales, 2 on flange. 2 species in W. Ind. Ocean.

CALLYODON (MARGARITODON) LUNULA (Snyder), 1908. **Pl 43, D, F** (Shimoni). **Margaritodon verweyi** Smith 1956, 15, Pl 43, D, F. 4 median preD scales and a pair overlapping in front: 2 on flange. P 2, 12. 18-20+20-25 rakers. Teeth white, 1-2 small upper canines. 22 ins. W. Ind. Ocean to 14°S, Pacific.
CALLYODON (MARGARITODON) AFRICANUS Smith, 1956, 15, Pl 42, A (Pinda). 5 median preD scales, and an overlapping pair in front: 2 on flange. P 2, 13. 20+30-35 rakers. Teeth blue, 2-3 large upper canines. 30 ins. W. Ind. Ocean from 21°S.

Cetoscarus Smith, 1956.

Type **Scarus pulchellus** Ruppell, 1835. 3 rows of scales on cheek, flange naked. 6 median preD scales. P 2, 12. No canines. In adults P not longer than snout. 2 species, Red Sea, W. Ind. Ocean, to Pacific.
CETOSCARUS PULCHELLUS (Ruppell), 1835. **Pl 43, E.** Generic characters. Spots on trunk and head. 50 ins. Fishes smaller than 20 ins. very rare.
CETOSCARUS BICOLOR (Ruppell), 1828. **Pl 44, C, D** & **E.** Generic characters. Spots on trunk, not head. 24 ins.

Chlorurus Swainson, 1839.

Type **Scarus gibbus** Ruppell, 1828. 4 median preD scales: 3 rows on cheek, flange naked. P 2, 14. About 20+40 rakers. 3 species: for distinction see above.
CHLORURUS GIBBUS (Ruppell), 1828, 81, Pl 20, f 2. **Fig. 5.** Teeth white, large upper canine. In life with swollen snout. 18 ins. Certainly known only from types, Red Sea.
CHLORURUS MICRORHINOS (Blkr.), 1854. **Fig. 4.** Teeth blue, large upper canine. In adults forehead almost over snout tip — a green line from rictus to operculum edge. 20 ins. Red Sea, Pacific, not certainly found in W. Ind. Ocean.
CHLORURUS STRONGYLOCEPHALUS (Blkr.), 1854. **Pl 42, C, F** male, **Pl 44, G**, fem., (Pinda). **C. microcheilos** Smith 1956, 16, Pl 44, G. Teeth blue, edge white, 1-2 upper canines, males with long Cd filaments. 24 ins. W. Ind. Ocean to 15°S, Pacific.

Hipposcarus Smith, 1956.

Type **Scarus harid** Forskal, 1775. See above for full account of genus and species. 4 median preD scales: flange naked. P 2, 13.
HIPPOSCARUS HARID HARID (Forskal), 1775. Ruppell 1828, 80, Pl 21, f 1, fem., f 2, male. Yellow line from rictus back: series blue spots above vent: body of Cd uniform. 24 ins. Red Sea only?
HIPPOSCARUS HARID VEXILLUS n. subsp. Pl 44, A, fem: **B**, male: Pinda: **Fig. 9**, juv. **H. harid** Smith 1956, 17, Pl 44, A, fem. B, male. In male head divided into 2 colour zones; no blue spots on side, Cd with bars or pattern. 30 ins. W. Ind. Ocean, E. Indies.

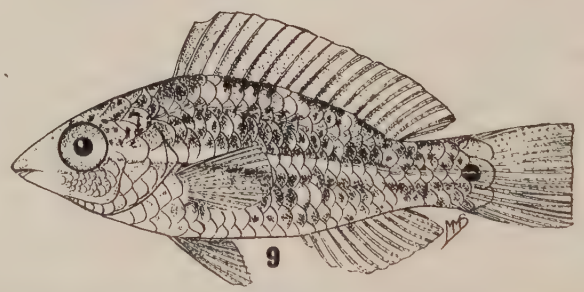

Fig. 9. **Hipposcarus harid vexillus**, 50 mm. (Mahé).

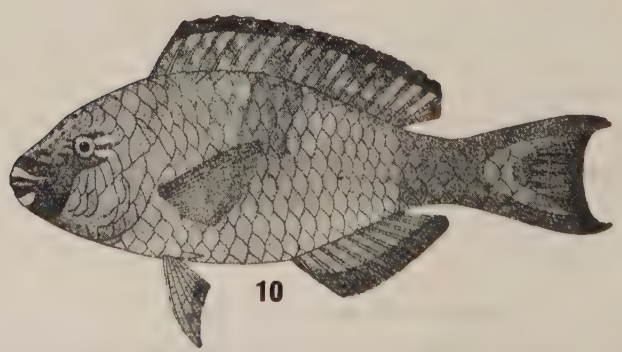

Fig. 10. **Callyodon marshalli** (Schultz), 1958. Type, 280 mm. (After Schultz).

LITERATURE LIST

BLEEKER 1847, Nat.& Gen.Arch.Ned.Ind. IV.
1854, Nat.Tijds.Ned.Ind. VI & VII.
1857, Nat.Tijdschr.Ned.Ind. XIII.
1861, Versl.Akad.Amsterdam XII.
1862, Atlas Ich. I.

C & V 1839 : Cuvier & Valenciennes Hist.Nat.Poiss. XIV.

FORSKAL 1775, Desc.Animalium.

FOWLER & BEAN 1928, U.S.N.M.Bull.100, VII.

GILCHRIST & THOMPSON 1909, Ann.S.A.Mus., VI.

GUICHENOT 1863, In Maillard L.Notes sur l'ile Reunion.
1865, Mem.Soc.Sci.Cherbourg II.

GUNTHER 1862, Cat.Fish.Brit.Mus. IV.
1909, Fische der Sudsee III.

JORDAN & GILBERT 1882, Bull.U.S.Nat.Mus.(1883), 16.

JORDAN & SEALE 1905, Proc.U.S.Nat.Mus. 28.
1906, Fish.Samoa.

KLUNZINGER 1871, Syn.Fische Roth.Meer.

LACEPEDE 1802, Hist.Nat.Poiss. IV.

ROUX-ESTEVE 1956, Resultats . . . Calypso II.

RUPPELL 1826-28, Atlas sur der Reise im Nordlichen Afrika.
1835, Neue Wirbelth. z. d. fauna v. Abyss.

SCHULTZ 1958, U.S.N.M.Bull. 214.

SMITH 1956, Ich.Bull. I.

SNYDER 1908, Proc.U.S.N.M. 35.

VALENCIENNES 1839, C & V Hist.Nat.Poiss. XIV.

WEBER & DE BEAUFORT 1940, Fish.Indo-Aus.Archip.

INDEX

Specific names recorded from Western Indian Ocean. Names in capitals are of species accepted as valid in this work. Some revisions of synonymy also included. Index of genera at end.

	Page
aeruginosus	272, 279
AFRICANUS	272, 280
APRIDENTATUS	270, 278-9
atropectoralis	271
BATAVIENSIS	267-9. 278
BICOLOR	274 5, 280
BIPALLIDUS	266, 268, 278
blochi Val.= quoyi Val.	
CAPISTRATOIDES	266, 268-9, 278
CAPITANEUS	268, 278
CARIFANUS	268, 278
CAUDOFASCIATUS	271, 279
CHLOROMELAS	278
coerulescens Klunz.= microcheilos	271
cyanescens	268
CYANOGNATHOS	271-2, 279
cyanotaenia	268-9
dussumieri Val.= GHOBBAN	270-1, 279
ERYTHRODON	269, 278
FALCIPINNIS	279
flavipectoralis	271
FORMOSUS	279
forskalii Klunz.= BATAVIENSIS	267-8
forsteri	265, 268-9
FOWLERI	267-8, 278
FRENATUS	268, 271-2, 279
fuscopurpureus Klunz.= VENOSUS	
GHOBBAN	266-8, 270-1, 278
GIBBUS	266, 269, 272-4, 277-8, 280
GLOBICEPS	279
guttatus Schn.= GHOBBAN	267, 278
HARID	266-7, 270, 274-80
HARID HARID	276, 280
HARID VEXILLUS	276-7, 280
IMPROVISUS	272, 279
JANTHOCHIR	279
javanicus	268
lazulinus	272, 279
LEPIDUS	279
longiceps	277
LUNULA	270, 272, 279-80
macrocheilos	277
maculosus Lac.= GHOBBAN	
MADAGASCARIENSIS	279
malindiensis	272
MARGARITUS	269, 278
MARSHALLI	279
mastax	275-7
microcheilos	272-4, 280
MICRORHINOS	272-4, 280
MURICATUS	266, 269, 273, 278
MUS	270, 279
natalensis G & T = GHOBBAN	
NIGER	279
nigripinnis	274-5
nuchipunctatus Val.= NIGER	
OKTODON	278
ophthalmistius Herre = BICOLOR	
parvidens	268
pectoralis	271, 279
pentazona	268, 278
pindae	272, 279
psittacus	266-7, 278
PULCHELLUS	274, 280
pyrrostethus = GHOBBAN	267
randalli	266, 270, 279
RHODUROPTERUS	278
RUBROFASCIATUS	271, 279
RUBROVIOLACEUS	270, 278
ruppellii Val.= HARID	
SCABER	271, 279
SCHULTZI	276-7
SEXVITTATUS	266, 270, 279
SINGAPORENSIS	272, 279
sordidus	266, 269
SPEIGLERI	270-1, 279
STRONGYLOCEPHALUS	272-4, 280
taeniurus	268, 278
ultramarinus	272-3
upolensis	270, 279
URBANUS	272, 279
VENOSUS	268, 278
vermiculatus	271. 279
verweyi	272, 279, 280
VEXILLUS, HARID	276-7, 280
viridibusius	279
VIRIDIFUCATUS	270, 278

Genera and Subgenera

(Those accepted as valid in Capitals)

BOLBOMETOPON	267, 269, 278
CALLYODON	267, 269, 270, 278
CETOSCARUS	268-9, 274, 280
CHLORURUS	266. 268, 272, 280
Erychthys	269
Hemistoma	269
HIPPOSCARUS	268, 274-7, 280
Loro	269
MARGARITODON	269, 272, 279
Petronason	269
SCAROPS	269, 270 (278)
Scarus	266-7, 269
XANOTHON	267-9, 278
YPSISCARUS	269, 270 (278)

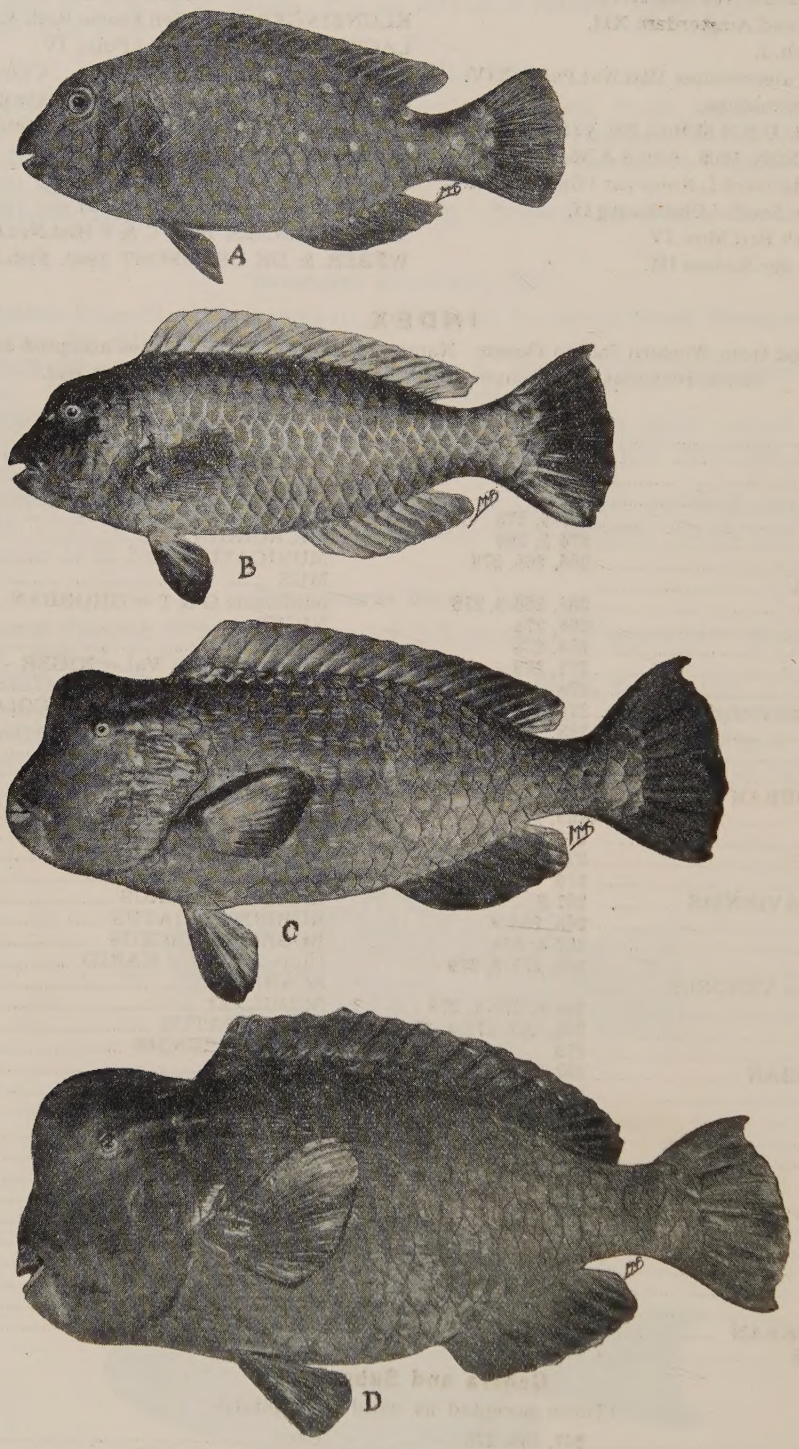

PLATE 45

Bolbometopon muricatus. A — 10 ins.; B — 22 ins.; C — 30 ins.; D — 44 ins.